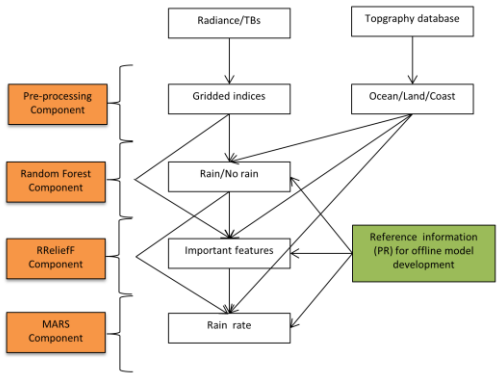

Figure 1: The framework of the RAMARS system.

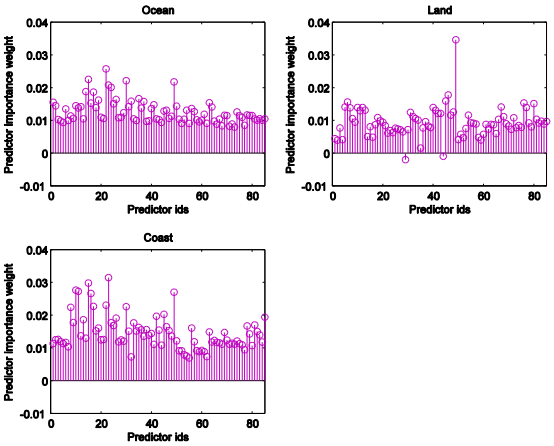

Figure 2: The predictor importance weights for the 85 predictor indices as revealed by the RReleifF algorithm.

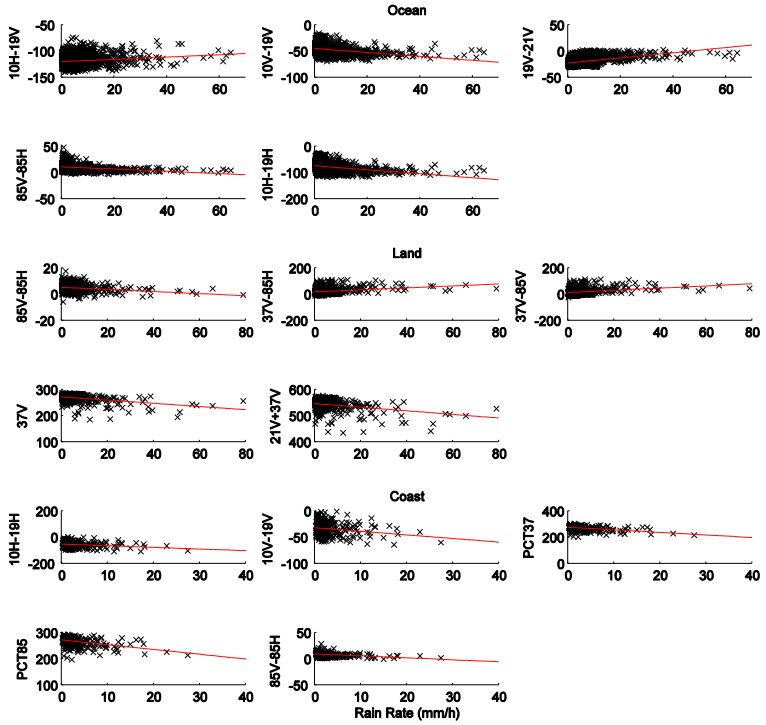

Figure 3: The indices as a function of rain rate over three surface types (ocean, land, and coast). Only top 5 features are shown as revealed by the RReliefF algorithm depending on the surface types.

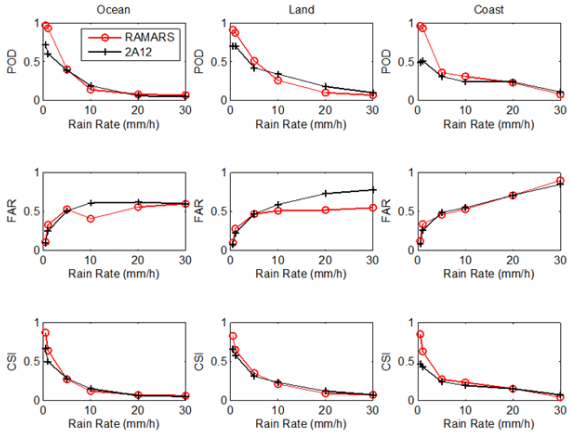

Figure 4: Comparison of the dichotomous skill scores (POD, FAR, and CSI) as a function of rain rate over ocean, land, and coast surface types.

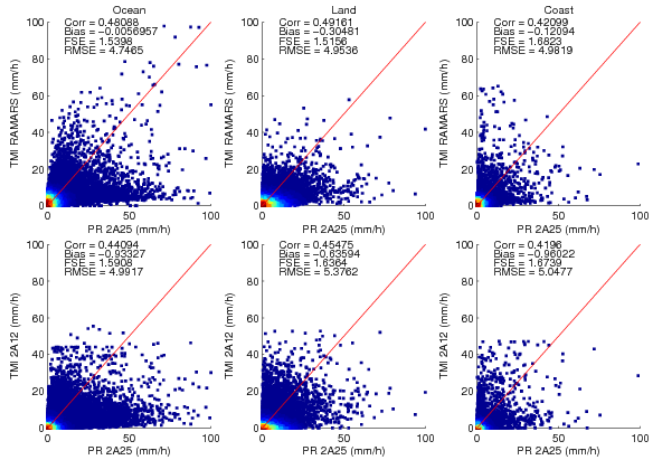

Figure 5: The evaluation of rain rate estimated by the RAMARS and 2A12 GPROF algorithm over ocean, land, and coast surface types. The PR 2A25 was taken as the "truth".

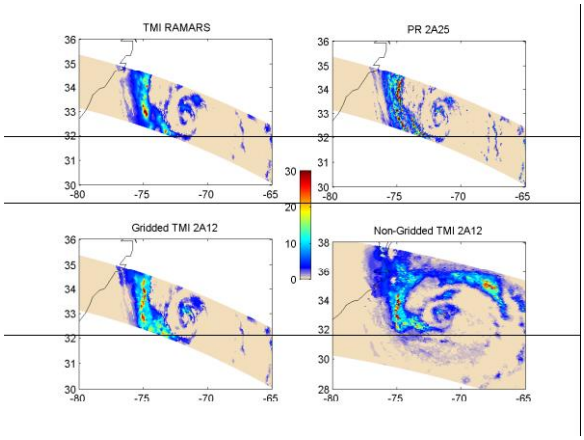

Figure 6: Case study of Hurricane Sandy over coastlines of Maryland, Virginia and North Carolina on 28th October 2012 showing the distribution of the hurricane field as produced by the TMI RAMARS, PR 2A25, and gridded TMI 2A12 algorithm. The non-gridded TMI 2A12 output is also shown in the bottom-right panel.

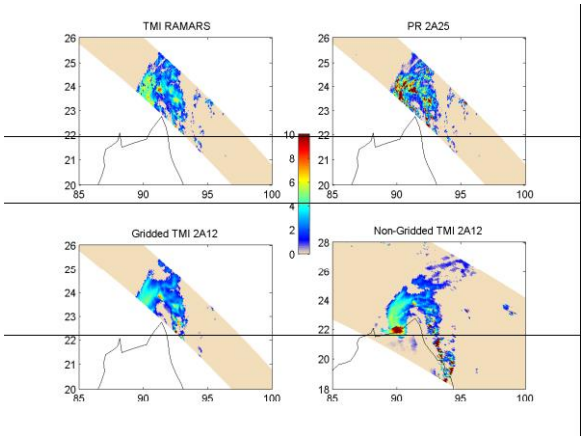

Figure 7: Case study of Cyclone Mahasen over Bangladesh on 16th May 2013 UTC 0406 showing the distribution of the hurricane field as produced by the TMI RAMARS, PR 2A25, and gridded TMI 2A12 algorithm. The non-gridded TMI 2A12 output is also shown in the bottom-right panel.

Table 1 Index numbers and the description of the 85 predictor indices used in the in the pre-processing component.

		14	10V-10H	22	10H-19V	29	19V-19H	35	19H-21V	40	21V-37V	44	37V-37H	47	37H-85V	49	85V-85H
		15	10V-19V	23	10H-19H	30	19V-21V	36	19H-37V	41	21V-37H	45	37V-85V	48	37H-85H		
1	10V	16	10V-19H	24	10H-21V	31	19V-37V	37	19H-37H	42	21V-85V	46	37V-85H				
2	10H	17	10V-21V	25	10H-37V	32	19V-37H	38	19H-85V	43	21V-85H						
3	19V	18	10V-37V	26	10H-37H	33	19V-85V	39	19H-85H								
4	19H	19	10V-37H	27	10H-85V	34	19V-85H										
5	21V	20	10V-85V	28	10H-85H												
6	37V	21	10V-85H														
7	37H																
8	85V	50	10V+10H	58	10H+19V	65	19V+19H	71	19H+21V	76	21V+37V	80	37V+37H	83	37H+85V	85	85V+85H
9	85H	51	10V+19V	59	10H+19H	66	19V+21V	72	19H+37V	77	21V+37H	81	37V+85V	84	37H+85H		
10	PCT_{37}	52	10V+19H	60	10H+21V	67	19V+37V	73	19H+37H	78	21V+85V	82	37V+85H				
11	PCT_{85}	53	10V+21V	61	10H+37V	68	19V+37H	74	19H+85V	79	21V+85H						
12	SI_{37}	54	10V+37V	62	10H+37H	69	19V+85V	75	19H+85H								
13	SI_{85}	55	10V+37H	63	10H+85V	70	19V+85H										
		56	10V+85V	64	10H+85H												
		57	10V+85H														

Table 2 Top ranked 5 indices as revealed by the RReliefF algorithm.

Rank	**1**	**2**	**3**	**4**	**5**
Ocean	10H-19V	10V-19V	19V-37V	85V-85H	10H-19H
Land	85V-85H	37V-85H	37V-85V	37V	21V+37V
Coast	10H-19H	10V-19V	PCT_{37}	PCT_{85}	85V-85H

Table 3. The predictive performance of the final MARS model by using 5-fold cross validation.

	Correlation	**Mean Bias**	**GCV**	**#Basis functions**
Ocean	0.73	0.01	32.23	20.00
Land	0.63	0.02	22.17	20.00
Coast	0.61	0.00	13.60	16.00

Table 4 Contingency table for the calculation of dichotomous scores.

		yes	**no**	**Total**
Prediction	yes	***hits***	***false alarms***	***prediction yes***
	no	***misses***	***correct negatives***	***prediction no***
Total		***observed yes***	***observed no***	***total***